

# Rocky Flats Environmental Technology Site

## PRO-476-RSP-16.02

### REVISION 1

## Pre-Demolition (Final Status) Radiological Surveys of Surfaces and Structures

Responsible K-H Org Radiation Protection Effective Date 5/22/01

Approved By Manager / Radiation Protection / 4/6/01  
Title Title of Organization Date

W G Zurlene / /s/  
Print Name Approval Signature

J W Mahaffey  
Print Name of Responsible Manager (N/A if RM is Approval Authority)

THE RESPONSIBLE MANAGER HAS DETERMINED THAT THE FOLLOWING ORGANIZATIONS' REVIEW/CONCURRENCE IS REQUIRED REVIEW/CONCURRENCE DOCUMENTATION IS CONTAINED IN THE PROCEDURE HISTORY FILE

|   |   |
|---|---|
| KH Analytical Services Division                             | 371/374 Closure Project                             |
| KH D&D Advance Planning                                     | 707 Closure Project                                 |
| KH Quality Assurance  | 771 Closure Project                                 |
| KH Radiological Engineering                                 | 776/777 Closure Project                             |
| Material Stewardship and Offsite Shipment Project           | Engineering Environmental Safety & Quality Programs |
| Remediation Industrial Building D&D & Site Services Project |   |

### IMPORTANT NOTES

ISR Review SISRC 01-13

SES/USQD Review SES-RFP-01 0787 MAW

Periodic Review Frequency 4 years from the effective date

This document supersedes PRO-476-RSP-16 02, Revision 0 and associated forms

REVIEWED FOR CLASSIFICATION/USC

By S. H. Mathusmeier / Classified  
Date 05-15-01 / Analyst

Approved for Public Release

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The following changes are active for this procedure.

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## **1 PURPOSE**

This procedure provides guidance for the final status survey of surfaces and structures during decommissioning, to demonstrate that residual radioactive material satisfies unrestricted release criteria.

## **2 SCOPE**

The floors, walls, ceilings, roof, and fixed equipment in the buildings are surveyed. These surveys shall include a Surface Scan, Total Surface Activity Survey, and a Removable Activity Survey.

The forms attached to this procedure are examples that are used in documenting survey/sampling information, however, equivalent forms may be used in lieu of the attached forms (i.e., appendices) as long as the information is equivalent to the minimum information required by the forms in this procedure.

This revision supersedes PRO-476-RSP-16 02, Revision 0 and associated forms.

## **3 RESPONSIBILITIES**

### **3.1 Radiological Engineer (RE)**

Evaluate the facility and appropriately classifying survey units.

Develop radiological survey packages and instructions for individual survey units.

Resolve issues regarding survey unit layout and grid requirements.

Review surveys and sample analysis results for completeness, accuracy, and legibility.

### **3.2 Radiological Control Technician (RCT)**

Perform surveys.

Provide initial review and sign off of collected data.

Provide complete, accurate and legible documentation.

### **3.3 RCT Technical Supervision (RCTTS)**

Perform the day-to-day supervision of the RCTs.

Review survey forms for accuracy.

Take the appropriate actions to mitigate the spread of contamination.

**3 4 Procedure User**

Read understand and comply with all requirements in this procedure

**4 REQUIREMENTS**

**4 1 Radiological Survey Requirements**

- 1 Final Status Survey (FSS) measurements will be conducted in accordance with survey instructions provided in survey packages, which will be developed by Radiological Engineering
- 2 Survey packages will be prepared prior to beginning the FSS
- 3 The measurements will be obtained by conducting surveys using approved methods and techniques such as surface scans surveys, total surface activity surveys removable surface activity surveys, and surface media samples (if required)

**4 2 Use of Background Radiological Surveys**

- 1 The Local Area Background (LAB) is the background counts seen by a detector that has a shield placed over the probe A ¾ inch slab of plywood, cardboard, or other thin material is normally sufficient shielding for alpha emitters A plexiglass shield (or equivalent) may be required for beta-gamma emitters The detector face may also be turned away from the surface of interest to assess the local area alpha background If a significant gamma emitter exists, the probe shield material will need to be assessed for use If material other than plywood is used it should have a nominal density sufficient to shield out any contaminants of concern Specific shielding technique will be documented in the Survey Package Instructions
- 2 LAB values should be obtained at each "total surface activity measurement" location just immediately before or after obtaining the actual total surface activity measurement, then recorded on Total Surface Activity Data Sheet (see Appendix 3) or equivalent
- 3 When measurements are taken on a material proven according to PRO-480-RSP-16 06, Radiological Background Determination to contain naturally occurring radioactive material (NORM) a material background subtraction may be used If material background subtraction values are not available or a Radiological Engineering evaluation determines that material background values are not necessary then a conservative material background value of zero may be used
- 4 Material background (if applicable) will be determined according to PRO-480-RSP-16 06, Radiological Background Determination

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5 GLOSSARY

5.1 Acronyms

|                     |  |
|---------------------|--|
| ASD                 | Analytical Services Division   |
| cpm                 | Counts Per Minute  |
| D&D                 | Decontamination and Decommissioning                                    |
| DCGL <sub>w</sub>   | Derived Concentration Guideline Level-Wilcoxon Rank Sum test           |
| DCGL <sub>EMC</sub> | Derived Concentration Guideline Level-Elevated Measurement Comparison  |
| DOE                 | U S Department of Energy   |
| dpm                 | Disintegration Per Minute  |
| DQA                 | Data Quality Assessment  |
| DQO                 | Data Quality Objectives  |
| EPA                 | U S. Environmental Protection Agency                                   |
| FDPM                | Facility Disposition Program Manual                                    |
| FSS                 | Final Status Survey (Analogous to Pre-Demolition Survey)               |
| FSSP                | Final Status Survey Plan (Analogous to Pre-Demolition Survey Plan)     |
| FSSR                | Final Status Survey Report (Analogous to Pre-Demolition Survey Report) |
| HSA                 | Historical Site Assessment   |
| IPC                 | In-Process Characterization  |
| LBGR                | Lower Bound of the Gray Region   |
| MARSSIM             | Multi-Agency Radiation Survey and Site Investigation Manual            |
| MDA                 | Minimum Detectable Activity  |
| MDC                 | Minimum Detectable Concentration                                       |
| NORM                | Naturally Occurring Radioactive Material                               |
| QA/QC               | Quality Assurance/Quality Control                                      |
| RCT                 | Radiological Control Technician  |
| RCTTS               | Radiological Control Technician Technical Supervision                  |
| RE                  | Radiological Engineer  |
| REM                 | Radiological Engineering Manager                                       |
| RFETS               | Rocky Flats Environmental Technology Site                              |
| RLC                 | Reconnaissance Level Characterization                                  |
| RLCP                | Reconnaissance Level Characterization Plan                             |
| RLCR                | Reconnaissance Level Characterization Report                           |
| RSM                 | Radiological Safety Manager  |
| TSA                 | Total Surface Activity   |
| V&V                 | Verification and Validation  |

## 5.2 Definitions

**Background Radiation** - Naturally occurring radiation which may include cosmic terrestrial (radiation from the naturally radioactive elements) and man-made radiation from nuclear fallout

**Background Value** - A numerical value statistically evaluated and expressed in the appropriate unit of measurement, defining the background radiation

**Classification** - The act or result of separating areas or survey units into one of three designated classes Class 1 area an area that is projected to require a Class 1 final status survey, Class 2 area an area that is projected to require a Class 2 final status survey, Class 3 area an area that is projected to require a Class 3 final status survey

**Class 1 Survey Unit** - Areas that have, or had prior to remediation a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys)

**Class 2 Survey Unit** - An area that has, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL<sub>w</sub>

**Class 3 Survey Unit** - Any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of radioactivity at a small fraction of the DCGL<sub>w</sub>, based on site operating history and previous radiological surveys

**DCGL (Derived Concentration Guideline Level)** - A derived, radionuclide-specific activity concentration within a survey unit corresponding to the release criterion

**Direct Measurement (Total Surface Activity Measurement)** - A radiological survey measurement performed by holding a detector on or close to the media being surveyed

**Final Survey** - Measurements and sampling to verify the radiological conditions of a site, following completion of decommissioning activities and in preparation for unrestricted release

**Impacted Area** - Areas that have some potential for containing contaminated material

**Non-Impacted Area** - Areas where there is no reasonable possibility (extremely low probability) of residual contamination Non-impacted areas are typically located off-site and may be used as background references areas

**Removable Activity** - Surface activity that can be removed and collected for measurement by wiping the surface with moderate pressure Also referred to as Removable Contamination, or Smearable Contamination

**Removable Survey** - Collecting smears for removable surface activity smears are obtained by wiping an area of approximately 100cm<sup>2</sup>, using a dry filter paper, while applying moderate pressure. A 47-mm diameter filter is typically used. A smear for removable contamination is typically obtained at each location of direct surface activity measurement (should be taken after the direct surface measurement)

**Scan Survey** - A qualitative radiological monitoring technique which is performed by moving a detector over the surface at some consistent speed and distance above the surface to detect elevated surface activity

**Surfaces and Structures** - Site buildings and their surfaces (e.g., floors, walls and ceilings). For purposes of the final survey, external surfaces of fixed equipment are also treated as surfaces and structures.

**Survey Package** - A collection of information in a standardized format for controlling and documenting field measurements taken for the final survey. A Survey package is prepared for each survey unit/survey area. The survey package includes the survey instructions, grid map(s), survey measurement data sheets and survey maps.

**Survey Point** - A subset of a measurement location where local measurements are taken, generally referring to an area covered by a detector, or an area of 100 cm<sup>2</sup> when a smear is taken

**Total Surface Activity** - Surface activity comprising of both removable activity, and fixed activity which cannot be removed by wiping the surface with moderate pressure.

**Unrestricted Release** - Release of a site from regulatory control without requirements for future radiological restrictions.

## 6 LIMITATIONS AND PRECAUTIONS

- Naturally occurring radioactive material has daughter products (progeny) that decay by alpha and beta emission and can be falsely interpreted as radioactive material (e.g., Pu-239, Am-241, U-235, etc.) resulting from DOE operations.



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- Generally surveys are performed in the order of surface scan total surface activity survey followed by removable surface activity survey. If the sequence of the total survey and the removable survey gets reversed, (i.e. smears samples are collected prior to total surface activity measurements), the total surface measurement should not be collected at the precise location of the removable surface activity measurement.
- Paint, self-adhesive labels, or other marking may shield alpha and beta contamination. Apply marking materials sparingly, and do not collect survey measurements directly on the marking.
- When final status survey operations are interrupted prior to completion (e.g., due to breaks, shift change, end of workday, etc.), positively identify stopping points to ensure the correct restart location and complete coverage of the required survey unit.
- Instrument-specific requirements (scan rate, count time, etc.) may differ from those provided in this procedure. For these cases, the requirements delineated in the survey package take precedence over this procedure.

## 7 PREREQUISITE ACTIONS

### Procedure User

- [1] Ensure that the following activities are performed prior to surveying
  - Decommissioning activities, (i.e., strip-out and removal) with the potential to contaminate the survey unit subsequent to final status survey are complete.
  - Isolation Controls are in place.
  - Survey personnel have been trained in the use of instrumentation and survey procedures prior to the collection of final survey data.
  - The survey package has been approved for implementation, including survey instructions regarding the location, number, and types of survey measurements required.
  - Review the area/activity-specific job hazard analysis (JHA) to identify and obtain any tools, personnel protective equipment (PPE), or equipment required to control the anticipated hazards.

## 8 INSTRUCTIONS

Sections 8.2 through 8.5 are stand-alone sections and may be performed independently in conjunction with Section 8.1

### 8.1 Survey/Sample Package Documentation

#### RCT

- [1] Maintain survey records in the survey package.

The survey package will be the primary method of controlling and tracking radiological survey results.

**NOTE** *DO NOT use shorthand, non-standardized terms, or opaque substances for corrections.*

- [2] Document surveys accurately and legibly in ink with sufficient detail to ensure that the meaning and intent of the record is clear.

[A] Make corrections as follow:

- [a] Draw a single line through the incorrect entry.
- [b] Record the correct entry.
- [c] Date and initial the correction.

- [3] Enter sufficient detail to ensure that the identification of the original survey and the sample location(s) is maintained and clear.

**NOTE** *When values are less than the Minimum Detectable Concentration (MDC), the actual value is annotated on the survey form.*

- [4] Record each specific value for the instrument used.

Data is entered for each and every survey point unless written direction is provided by RE

- [5] Record the Local Area Background (LAB) when obtained.

- [6] If required, record the material type for each measurement.

- [7] Record applicable information on the survey form(s), in addition to the radiological data.

- [8] Record all required instrument information on the appropriate survey forms.

- [9] Record any pertinent information needed to interpret the survey results
- [10] Record name, signature and employee number of individual(s) performing the survey on the Survey Signature Sheet (see Appendix 4)
- [11] Once all survey results have been recorded, maintain all survey forms in survey package
- [12] Submit the completed survey package to the RCTTS for review

## 8.2 Surface Scanning Requirements

### RCT

**NOTE** *Scan survey coverage can vary from biased (judgmental) to 100 percent of the accessible surface area*

- [1] Perform a scan survey for total surface activity per the requirements in the survey package

**NOTE** *The scan minimum detectable concentration (MDC) must be equal to or less than the Derived Concentration Guideline Level Elevated Measurement Comparison (DCLG<sub>EMC</sub>) or applicable action level (refer to survey package)*

- [2] Utilize the flowcharts locations (refer to Appendix 2, page 1) provided to flag and investigate elevated measurements

Flowcharts should be developed for other instrumentation that is utilized for the survey. Requirements (flag levels, etc.) for the flowcharts are based on the guidance provided in the survey package.

- [3] Complete and sign Survey Signature Sheet (see Appendix 4)

## 8.3 Total Surface Activity Survey Requirements

**NOTE** *Total Surface Activity Measurements are typically collected prior to the collection of removable activity and media samples. If not practical, collect the measurement immediately adjacent to the removable activity/sample location.*

### RCT

- [1] Obtain the approved survey package, amplifying instructions, survey maps, flowcharts, and other necessary information (such as applicable safety requirements) to perform surveys

- [2] Select Alpha/Beta NE Electra w/ DP 6 Probe, or equivalent instrument for total activity measurements

- [A] Perform a pre-operational inspection and record all pre-operational check data on appropriate form

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[B] Record instrument information on Instrument Data Sheet (see Appendix 5)

[3] IF NOT already completed,  
THEN transpose survey numbers from attached survey maps onto labels at each corresponding measurement location on the survey unit surfaces

[4] Obtain a total surface activity (direct) measurement and record actual numeric results as gross counts per minute (gcpm) on Total Survey Activity Data Sheet (see Appendix 3), refer to survey package for count time.

[5] Obtain at each survey point a LAB (cpm), refer to Section 4.2, and record on Total Survey Activity Data Sheet (refer to survey package for count time)

[6] Collect QC measurements (number to be specified in survey package) over the range of positive values (i.e., results greater than zero) in accordance with PRO-479-RSP-16 05, Radiological Survey/Sample Quality Control for Final Status Survey

[7] Record results on Total Survey Activity Data Sheet.

NOTE 1 The mean LAB count is subtracted from the location-specific gross count after each is converted to dpm by dividing by the instrument efficiency

NOTE 2 A post-survey performance check is required in accordance with Site Radiological Control Manual Chapter 3 Part 3. Data is suspect unless performance check passes as per PRO-479-RSP-16 05

[8] Complete and sign Survey Signature Sheet (see Appendix 4)

#### 8.4 Removable Activity Survey Requirements

NOTE 1 Swipes are typically collected following the performance of total surface activity measurements and prior to the collection of media samples

NOTE 2 Swipe technique for removable surface activity are typically obtained by wiping an area of approximately 100 cm<sup>2</sup>, using a dry filter paper, while applying moderate pressure. A 47-mm diameter filter is typically used. A swipe for removable contamination is obtained at each total activity measurement location.

#### RCT

[1] Obtain a 100 cm<sup>2</sup> removable swipe at each labeled sample location (surface area smeared may vary if annotated in the survey package).

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- [2] Place swipes into envelope or other containers to prevent cross-contamination while awaiting analysis
- [3] Analyze swipes using an approved Tennelec instrument or equivalent
  - [A] IF analyzed manually (i.e., SAC-4, BC-4 L-2929/43-10-1), THEN record the required instrument data on Instrument Data Sheet (see Appendix 5) and survey results on Removable Activity Data Sheet (see Appendix 6)
- NOTE *Computer generated forms contain all the same information as Appendix 6*
- [B] IF analyzed by a Tennelec, THEN attach computer-generated reports to the survey package
- [4] Complete and sign Survey Signature Sheet (see Appendix 4)
- [5] Forward the survey package to the RCT Technical Supervisor for review

## 8.5 Investigation Surveys

NOTE *Survey package instructions and the flowcharts (refer to Appendix 2 page 2) provide guidance and direction in the performance of Investigation Surveys*

### RCT

- [1] Verify the elevated measurement by taking a second TSA measurement in the exact same location and record results on the Scan Survey/Investigation Documentation Form (Appendix 7) and the instrument information on the Instrument Data Sheet (Appendix 5). If the second TSA measurement is less than 100 dpm/100 cm<sup>2</sup>, the investigation is complete. Record the second TSA measurement on the Survey Package Scan and Investigation form.
- [2] Select one or both of the following investigation methods
  - [A] Determine if the elevated reading(s) is/are due to DOE added material
- NOTE *Po<sup>210</sup> a radon daughter product may accumulate on oxidized metal surfaces and/or where rainwater accumulates and evaporates*
  - 1) The location(s) in question should be sealed and allowed to decay and then remeasured for TSA. Radiological Engineering is contacted for specific instructions.

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**NOTE** *In areas where short-lived natural radioactivity is suspected the surveyed surface may be sealed from atmosphere using airtight tape and/or plastic to allow for short-lived isotope decay. Material or property believed to be free of contamination may be unsealed and recounted a minimum of twenty (20) minutes after the initial count to allow for decay of short-lived radionuclides. A decrease in alpha activity over 20 minutes, accompanied by beta activity indicates the presence of the short-lived naturally occurring radionuclides. Recounting two to four hours after the initial count allows for a majority of naturally occurring radioactive material to decay. Recounting after additional hours of decay may result in further decreases in observed activity.*

- 2) Isotopic analysis such as spectroscopy or wet chemistry may be needed to distinguish between alpha activity from radioactive material (e.g.,  $\text{Pu}^{239}$ ,  $\text{Am}^{241}$ ,  $\text{U}^{235}$ , etc.) resulting from DOE operations and Naturally Occurring Radioactive Material (NORM). Radiological Engineering is contacted for specific instructions.

- [B] Perform a nine-point average by collecting 8 additional measurements from an area approximately 1 m<sup>2</sup> centered around the original elevated measurement for a total of 9 measurements in three rows of three measurements each

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**9 POST-PERFORMANCE ACTIVITY**

**NOTE** *Documentation generated as result of this procedure is retained and  
disposed per Section 10 Records Processing Instructions*

**RCT Technical Supervisor**

- [1] Review survey package to ensure that survey(s) has been completed as required and documentation is accurate and complete
- [2] Return unacceptable survey package(s) to the RCT performing/documenting the survey for correction
- [3] Ensure the RCT promptly corrects errors and omissions and resubmits the survey results.
- [4] **WHEN** it is not possible for the originator to correct an error,  
**THEN** explain on the applicable form, why originator could not make corrections
  - [A] Enter the correction
  - [B] Initial and date the correction.
- [5] Not all lines or blanks will be pertinent for all surveys performed

Each blank must have an entry in it so that an improper entry may not be entered later. This can be accomplished by a line out of a section with a continuous single line, initialing and dating the line or use the lettering "NA" or "N/A" to indicate "not applicable"
- [6] Sign Survey Signature Sheet (see Appendix 4) denoting all required surveys/samples have been completed.
- [7] Forward the survey package to the Radiological Engineer for data analysis and final disposition



## 10 RECORDS PROCESSING INSTRUCTIONS

The following documents are handled or initiated during performance of the activities described in this procedure

| Record Identification   | Record Type                     | Protection/Storage   | Processing Instructions   |
|---|---------------------------------|--|---|
| <b>In process</b><br>Appendix 3 Total Surface Activity Data Sheet or equivalent<br>Appendix 4 Survey Signature Sheet or equivalent<br>Appendix 5 Instrument Data Sheet, or equivalent<br>Appendix 6, Removable Activity Data Sheet, or equivalent<br>Appendix 7, Scan Survey/Investigation Documentation Form, or equivalent and other documentation as identified in the procedure that make-up the Survey Package | In process QA Record (Non WIPP) | Responsible Manager implements a reasonable level of protection for in-process QA records to prevent loss or degradation. Records are stored in standard office filing systems.  | Continued prescribed processing of documents. Upon completion of processing, approval and authentication records are transmitted to appropriate Records Center (e.g., Project Records) in accordance with 1-V41-RM-001 Records Management Manual. |
| <b>Completed</b><br>Same as forms as identified above   | Completed QA Record (Non-WIPP)  | Responsible Manager implements a reasonable level of protection for QA records to prevent loss or degradation in conjunction with Site Records Management organization to assure reasonable level of controls are being implemented. | When inactive as defined in 1-V41-RM-001, Records Management Manual transfer to Site Records Management for archiving in accordance with 1-V41-RM-001.  |

## 11 REFERENCES

The following documents are either directly referenced or used in the development of this procedure

DOE Order 5400.5 - Radiation Protection of the Public and the Environment

MAN-102-SRCM Rocky Flats Environment Technology Site Radiological Control Manual

MAN-127-PDSP, Pre-Demolition Survey Plan (also referred to as Site PDSP)

NUREG-1575, Multi-Agency Radiation Survey and Site Investigation Manual  
(MARSSIM)

PRO-479-RSP-16 05, Radiological Survey/Sample Quality Control for Final Status  
Survey

PRO-480-RSP-16 06, Radiological Background Determination

RF/RMRS-97-123 UN, Radiological Closeout Survey Plan for the 779 Cluster

TBD-00153, Use of the Oasis for Direct Differentiation between Po-210 and DOE-added  
materials

TBD-00156, Using Graphical Data Distribution Analysis to Distinguish between  
background and DOE-added Materials in Environmental Data Sets

Title 10 Code of Federal Regulations Part 835, Occupational Radiation Protection

1-V41-RM-001, Records Management Manual

3-PRO-165-RSP-07 02, Contamination Monitoring Requirements

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**APPENDIX 1**  
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**SURFACE CONTAMINATION GUIDELINES (DCGLs)**

| Radionuclides <sup>2/</sup>   | DCGL <sub>w</sub> <sup>3/</sup> Total Average <sup>4/</sup> (dpm/100 cm <sup>2</sup> ) | DCGL <sub>EMC</sub> Total Maximum <sup>4/ 5/</sup> (dpm/100 cm <sup>2</sup> ) | DCGL <sub>w</sub> Removable <sup>4/ 6/</sup> (dpm/100 cm <sup>2</sup> ) |
|---|--|---|---|
| Transuranics, I 125 I 129 Ra 226 Ac 227 Ra 228 Th 228 Th 230 Pa 231   | 100  | 300   | 20  |
| Th Natural Sr 90 I 126 I 131 Ra 223 Ra 224 U 232 Th 232   | 1 000  | 3 000   | 200   |
| U-Natural U 235 U 238 and associated decay products, alpha emitters   | 5 000  | 15 000  | 1 000   |
| Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr 90 and others noted above <sup>7/</sup> | 5 000  | 15 000  | 1 000   |
| Tritium (applicable to surface and Subsurface ) <sup>8/</sup>   | Not Applicable   | Not Applicable  | 10 000  |

1/ As used in this table dpm (disintegration per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background efficiency and geometric factors associated with the instrumentation

2/ Where surface contamination by both alpha and beta gamma emitting radionuclides exists, the limits established for alpha and beta gamma radionuclides should apply independently

3/ Measurements of average contamination should not be averaged over an area of more than 1 m<sup>2</sup> For objects of less surface area, the average should be derived for each such object

4/ The average and maximum dose rates associated with surface contamination, resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h respectively at 1 cm

5/ The maximum contamination level applies to an area of not more than 100 cm<sup>2</sup> DOE 5400.5 Chg 2 IV 7

6/ The amount of removable material per 100 cm<sup>2</sup> of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency When removable contamination on objects of surface area less than 100 cm<sup>2</sup> is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination

7/ This category of radionuclides includes mixed fission products including the Sr 90 which is present in them It does not apply to Sr 90 which has been separated from the other fission products or mixtures where the Sr 90 has been enriched

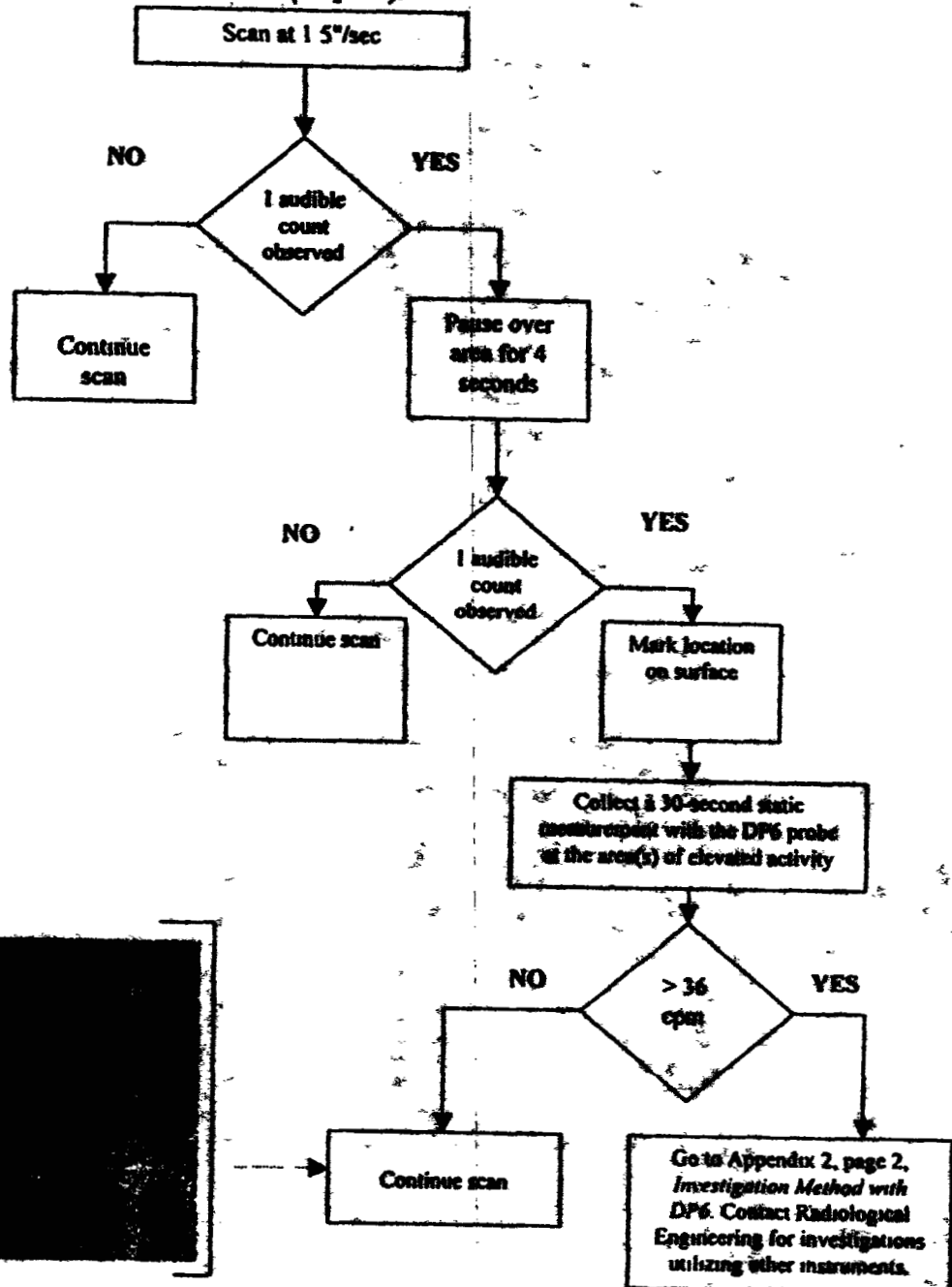
8/ Property recently exposed or decontaminated should have measurements (swipes) at regular time intervals to ensure that there is not a build up of contamination over time Because tritium typically penetrates material it contacts the surface guidelines for beta gamma emitters are not applicable to tritium. The DOE has reviewed the analysis conducted by the DOE Tritium Surface Contamination Limit Committee ( Recommended Tritium Surface Contamination Release Guides, February 1991), and has assessed potential doses associated with the release of property containing residual tritium The DOE recommends the use of the stated guideline as an interim value for removable tritium Measurements demonstrating compliance of the removable fraction of tritium on surfaces with this guideline are acceptable to ensure that non removable fractions and residual tritium in mass will not cause exposures that exceed DOE dose limits and constraints

**APPENDIX 2**

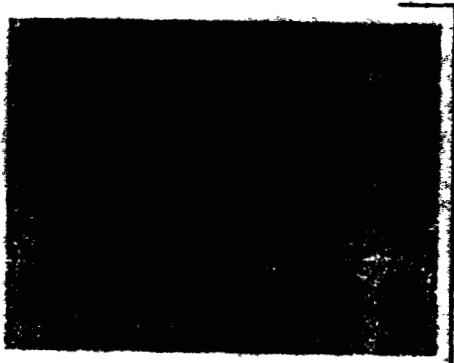
Page 1 of 3

**SCAN AND INVESTIGATION METHODS WITH SELECTED INSTRUMENTS**

**Scan Method with DP6 (example)  
(Alpha)**



CHG 16 02 I 2

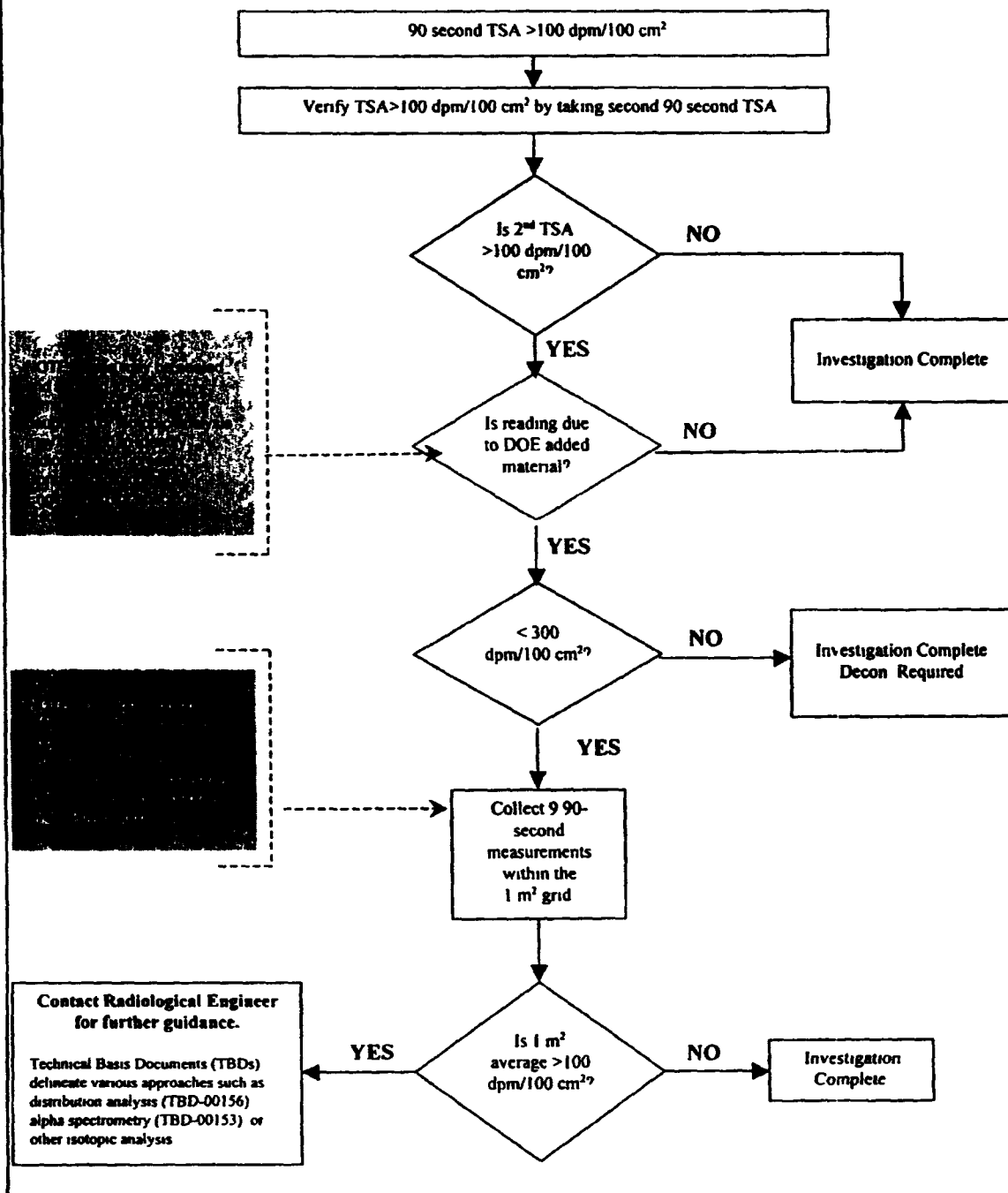


**APPENDIX 2**

Page 2 of 3

**Investigation Method with DP6  
(Alpha)**

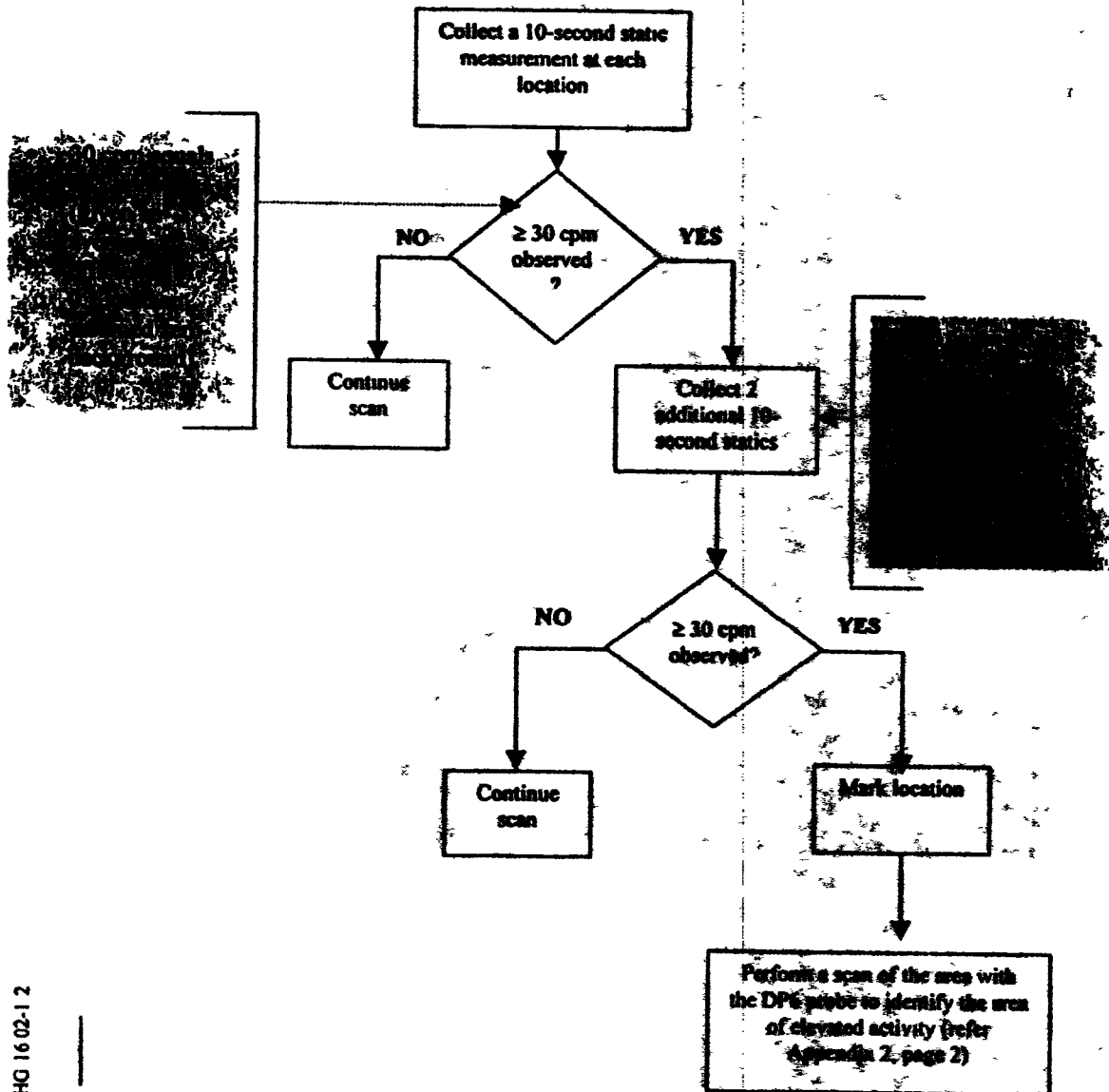
CHG 16 02 1 2



**APPENDIX 2**

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**Alpha Scan Method with DP8A or equivalent  
Revision 1**



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22

**APPENDIX 3**  
 Page 1 of 1

**TOTAL SURFACE ACTIVITY DATA SHEET**

CHG 16 02 1 2

| Survey Area  |                                | Survey Unit                             |           |           |             | Building                                 |           |           |             |
|--|--------------------------------|---|-----------|-----------|-------------|--|-----------|-----------|-------------|
| Survey Area/Unit Description   |                                |   |           |           |             |  |           |           |             |
| <b>Total Surface Activity Data Sheet</b><br><input type="checkbox"/> Alpha <input type="checkbox"/> Beta/gamma |                                |   |           |           |             |  |           |           |             |
| Sample Location  | Material Type<br>(If Required) | Pre Total Surface Activity Measurements |           |           |             | Post Total Surface Activity Measurements |           |           |             |
|  |                                | RCT ID #                                | Inst ID # | LAB (cpm) | Gross (cpm) | RCT ID #                                 | Inst ID # | LAB (cpm) | Gross (cpm) |
| 1  |                                |   |           |           |             |  |           |           |             |
| 2  |                                |   |           |           |             |  |           |           |             |
| 3  |                                |   |           |           |             |  |           |           |             |
| 4  |                                |   |           |           |             |  |           |           |             |
| 5  |                                |   |           |           |             |  |           |           |             |
| 6  |                                |   |           |           |             |  |           |           |             |
| 7  |                                |   |           |           |             |  |           |           |             |
| 8  |                                |   |           |           |             |  |           |           |             |
| 9  |                                |   |           |           |             |  |           |           |             |
| 10   |                                |   |           |           |             |  |           |           |             |
| 11   |                                |   |           |           |             |  |           |           |             |
| 12   |                                |   |           |           |             |  |           |           |             |
| 13   |                                |   |           |           |             |  |           |           |             |
| 14   |                                |   |           |           |             |  |           |           |             |
| 15   |                                |   |           |           |             |  |           |           |             |
| 16   |                                |   |           |           |             |  |           |           |             |
| 17   |                                |   |           |           |             |  |           |           |             |
| 18   |                                |   |           |           |             |  |           |           |             |
| 19   |                                |   |           |           |             |  |           |           |             |
| 20   |                                |   |           |           |             |  |           |           |             |
| — QC   |                                |   |           |           |             |  |           |           |             |
| — QC   |                                |   |           |           |             |  |           |           |             |
| Comments   |                                |   |           |           |             |  |           |           |             |

COUNT TIME = \_\_\_\_\_ (sec)

**Note** QC measurements are to be collected with a different instrument than the original survey. Mark the QC location number in the "Sample Location" column.

**APPENDIX 4**

Page 1 of 1

**SURVEY SIGNATURE SHEET**

|   |                  |              |                           |          |      |
|---|------------------|--------------|---------------------------|----------|------|
| Survey Area   |                  | Survey Unit: |                           | Building |      |
| Survey Area/Unit Description                                      |                  |              |                           |          |      |
| <b>SURVEY SIGNATURE SHEET</b>                                     |                  |              |                           |          |      |
| <b>Removable/Total Surface Activity/Scan Surveys Performed By</b> |                  |              |                           |          |      |
| RCT ID # 1  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 2  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 3  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 4  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 5  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 6  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| <b>Quality Control Measurements Performed By</b>                  |                  |              |                           |          |      |
| RCT ID # 7  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 8  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 9  |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| RCT ID # 10   |                  |              |                           |          |      |
|   | RCT Printed Name | Employee #   | RCT Signature             | Date     |      |
| <b>Survey Reviewed By</b>   |                  |              |                           |          |      |
| RCT Supervision Printed Name                                      |                  | Employee #   | RCT Supervision Signature |          | Date |

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**APPENDIX 5**

Page 1 of 1

**INSTRUMENT DATA SHEET**

|  |         |             |   |          |   |   |   |   |    |    |
|--|---------|-------------|---|----------|---|---|---|---|----|----|
| Survey Area  |         | Survey Unit |   | Building |   |   |   |   |    |    |
| Survey Area/Unit Description                       |         |             |   |          |   |   |   |   |    |    |
| <b>INSTRUMENT DATA SHEET</b>                       |         |             |   |          |   |   |   |   |    |    |
| <b>Removable Activity Survey Instrument Data</b>   |         |             |   |          |   |   |   |   |    |    |
| Manufacturer                                       |         |             |   |          |   |   |   |   |    |    |
| Model  |         |             |   |          |   |   |   |   |    |    |
| Inst ID #  | 1       | 2           | 3 | 4        | 5 |   |   |   |    |    |
| Serial #   |         |             |   |          |   |   |   |   |    |    |
| Cal Due Date                                       |         |             |   |          |   |   |   |   |    |    |
| Analysis Date                                      |         |             |   |          |   |   |   |   |    |    |
| Alpha Bkgd (cpm)                                   | EXAMPLE |             |   |          |   |   |   |   |    |    |
| Alpha Eff (c/d)                                    |         |             |   |          |   |   |   |   |    |    |
| Instrument $\alpha$ MDC (dpm/100 cm <sup>2</sup> ) |         |             |   |          |   |   |   |   |    |    |
| Beta Bkgd (cpm)                                    |         |             |   |          |   |   |   |   |    |    |
| Beta Eff (c/d)                                     |         |             |   |          |   |   |   |   |    |    |
| Instrument $\beta$ MDA (dpm/100 cm <sup>2</sup> )  |         |             |   |          |   |   |   |   |    |    |
| <b>Total Surface Activity Instrument Data</b>      |         |             |   |          |   |   |   |   |    |    |
| Manufacturer                                       |         |             |   |          |   |   |   |   |    |    |
| Model  |         |             |   |          |   |   |   |   |    |    |
| Inst ID #  |         |             |   |          |   | 7 | 8 | 9 | 10 | 11 |
| Serial #   |         |             |   |          |   |   |   |   |    |    |
| Cal Due Date                                       |         |             |   |          |   |   |   |   |    |    |
| Analysis Date                                      |         |             |   |          |   |   |   |   |    |    |
| Alpha Bkgd (cpm)                                   |         |             |   |          |   |   |   |   |    |    |
| Alpha Eff (c/d)                                    |         |             |   |          |   |   |   |   |    |    |
| Instrument $\alpha$ MDC (dpm/100 cm <sup>2</sup> ) |         |             |   |          |   |   |   |   |    |    |
| Beta Bkgd (cpm)                                    |         |             |   |          |   |   |   |   |    |    |
| Beta Eff (c/d)                                     |         |             |   |          |   |   |   |   |    |    |
| Instrument $\beta$ MDA (dpm/100 cm <sup>2</sup> )  |         |             |   |          |   |   |   |   |    |    |

**APPENDIX 6**  
Page 1 of 1

**REMOVABLE ACTIVITY DATA SHEET**

| Survey Area                   |          | Survey Unit |         | Building     |         |
|-------------------------------|----------|-------------|---------|--------------|---------|
| Survey Area/Unit Description  |          |             |         |              |         |
| Removable Activity Data Sheet |          |             |         |              |         |
| Location #                    | RCT ID # | Inst ID #   |         | Gross counts |         |
|                               |          | $\alpha$    | $\beta$ | $\alpha$     | $\beta$ |
| 1                             |          |             |         |              |         |
| 2                             |          |             |         |              |         |
| 3                             |          |             |         |              |         |
| 4                             |          |             |         |              |         |
| 5                             |          |             |         |              |         |
| 6                             |          |             |         |              |         |
| 7                             |          |             |         |              |         |
| 8                             |          |             |         |              |         |
| 9                             |          |             |         |              |         |
| 10                            |          |             |         |              |         |
| 11                            |          |             |         |              |         |
| 12                            |          |             |         |              |         |
| 13                            |          |             |         |              |         |
| 14                            |          |             |         |              |         |
| 15                            |          |             |         |              |         |
| 16                            |          |             |         |              |         |
| 17                            |          |             |         |              |         |
| 18                            |          |             |         |              |         |
| 19                            |          |             |         |              |         |
| 20                            |          |             |         |              |         |
| 21                            |          |             |         |              |         |
| 22                            |          |             |         |              |         |
| 23                            |          |             |         |              |         |
| 24                            |          |             |         |              |         |
| 25                            |          |             |         |              |         |
| Comments                      |          |             |         |              |         |

COUNT TIME = \_\_\_\_ (sec)

Page \_\_\_\_ of \_\_\_\_

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[illegible]
$$\frac{27}{27}$$